Birds of the riparian corridors of Potchefstroom, South Africa

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Dissertation submitted in partial fulfilment of the requirements for the degree Magister Scientiae in Environmental Sciences at the North-West University (Potchefstroom Campus)

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November 2012

Potchefstroom

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Acknowledgements

I would like to dedicate this project to our Heavenly Father who has given me the talent, intelligence, and the determination to complete this study.

I would also like to thank the following people who were involved, and have been a great help to me during this study.

- My lovely wife Lynette, who supported and motivated me throughout this study.
- Professor Henk Bouwman, for his guidance and support.
- Professor Sarel Cilliers, for his financial contribution.
- Professor Pieter Theron and Dr. Gorden O'Brien, for their guidance and support.
- School of Biological Sciences, for providing infrastructure and the use of their vehicles for fieldwork.
- Lastly, my parents, brother and two sisters who supported me during the completion of this study.

White-throated Swallow, *Hirundo albigularis* underneath a road bridge in Wasgoed Spruit

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Abstract

A riparian ecosystem is the area between the aquatic and terrestrial setting of a stream, and serves as a corridor and habitat for birds. Several riparian ecosystems are located in urban environments, and three main riparian corridors are located in Potchefstroom. They are the Mooi River, Wasgoed Spruit, and Spitskop Spruit, which encompass a wide range of different vegetation types and anthropogenic factors. Therefore, different habitat types for birds occur along the riparian corridors of Potchefstroom. Factors such as food and water availability, nesting sites, competition, predation, learning, presence of other species, and those species that are able to adapt to environmental changes influence the avian diversity and communities along riparian corridors.

The hypothesis is that bird variables along the riparian corridors in Potchefstroom are affected by vegetation, anthropogenic, and seasonal influences. To investigate these affects, two secondary objectives were formulated. The first was to characterise riparian avian habitats (CAHs) according to vegetation and anthropogenic factors, and the second was to identify temporal and spatial changes in avian variables.

The three streams were divided into 79 consecutive transects, each 300 m long. The study area consisted of: 17 transects along Spitskop Spruit, 12 along Wasgoed Spruit and 50 along the Mooi River. Bird observations were conducted monthly from June 2006 to June 2007. Birds that were observed with a perpendicular distance ≤ 30 meters towards the streams were included in the results. The bird species that were observed were also classified into different nesting and feeding guilds.

Environmental data recorded included: vegetation structure (estimated cover percentages and height classes of trees, shrubs, grasses, herbs, sedges, and reeds), anthropogenic structures (estimated cover percentages of roads, footpaths, bridges, electrical pylons, houses, and drainage pipes), and the presence of informal settlers along each transect (the mean number of people and the space they occupy). Vegetation was monitored in summer–

(February 2007 until April 2007) and winter months (June 2007 until August 2007). The anthropogenic structures and the presence of informal settlers (anthropogenic factors) were monitored simultaneously with the bird counts.

Transect-time profiles were drawn for the four parameters, which differed on spatial and time scales. Multivariate analyses included non-metric multidimensional scaling (NMS), cluster analysis, and indicator species analysis. Cluster analyses and NMS bi-plots were used to define characterised avian habitats (CAHs). Two types of CAHs were characterised: Summer CAHs (summer vegetation and anthropogenic factors) and Anthropogenically CAHs (Anthropogenic factors alone). Bird species were then ordinated with the summer and anthropogenically CAHs on NMS successional vector graphs. The successional vectors illustrate the avian community trajectories of the different CAHs. Indicator species analyses were performed to describe associations between the bird species and the summer and anthropogenically CAHs.

The summer and anthropogenic CAHs that were characterised had different avian community trajectories and different species were associated with these CAHs. Different levels in avian diversity appeared among these CAHs, and convergence and divergence in communities appeared among these CAHs. Birds also selected their habitats according to feeding and nesting behaviours.

Consequently, it can be deduced that environmental factors such as vegetation structures and anthropogenic factors, as well as seasonality, had an effect on the distribution of birds along the riparian corridors of Potchefstroom.

Voëls langs die rivieroewers van Potchefstroom, Suid-Afrika (Birds of the riparian corridors of Potchefstroom, South Africa)

Opsomming

'n Rivieroewer bestaan uit 'n akwatiese en terrestriële deel, en dien as 'n korridor en 'n habitat vir voëls. Daar is heelwat rivieroewers in stedelike omgewings, en drie word in Potchefstroom gevind, naamlik die Mooirivier, Wasgoedspruit en Spitskopspruit, en elk bestaan uit 'n verskeidenheid van plantegroeitipes en antropogeniese faktore. Dit wil sê, verskillende habitattipes vir voëls kom langs die betrokke oewers voor. Faktore soos die beskikbaarheid van voedsel en water, die geskiktheid van nesmaakplekke, kompetisie, predasie, leer, die teenwoordigheid van ander spesies, en die potensiaal van spesies om aan te pas by omgewingsveranderinge beïnvloed die voëldiversiteit en -gemeenskapsamestelling langs rivieroewers.

Die volgende hipotese is geformuleer: "Voëlveranderlikes langs die rivieroewers van Potchefstroom word geaffekteer deur verskillende plantegroeitipes, antropogeniese faktore, en seisoenswisselinge." Om die hipotese te ondersoek, is twee sekondêre doelwitte geformuleer. Die eerste was om verskillende voëlhabitatte te karakteriseer (KVHe) na aanleiding van die verskillende plantegroeitipes en die antropogeniese faktore. Die tweede doelwit was om voëlveranderlikes oor tyd en ruimte bepaal.

Nege-en-sewentig transekte is in die studie-area uitgemeet, en elke transek was ongeveer 300 meter lank. Daar was sewentien transekte langs Spitskopspruit, twaalf langs die Wasgoedspruit, en vyftig langs die Mooirivier. Voëlwaarnemings is gekwantifiseer in terme van spesierykheid en volopheid, en is maandeliks bepaal in elke transek vanaf Junie 2006 tot Julie 2007. Die voëls is ook geklassifiseer in nes- en voedselgilde, en is slegs getel as hulle binne 30 meter aan weerskante van die stroom voorgekom het.

Omgewingsdata het bestaan uit plantegroeistrukture (persentasie bedekkings en onderskeidende hoogtes van bome, struike, kruie, watergrasse, en riete) en antropogeniese faktore (persentasie bedekking van paaie, voetpaadjies, brûe, kraglyne, huise, en dreineringspype), asook die

teenwoordigheid van hawelose mense langs elke transek (die gemiddelde aantal persone en die area wat hulle benut). Plantegroei is gemoniteer tydens somer (Februarie 2007 tot April 2007) en winter (Junie 2007 tot Augustus 2007), en die antropogeniese strukture en die teenwoordigheid van hawelose mense (antropogenese faktore) is gemoniteer tydens die voëlopnames.

Transek/tydgrafieke is getrek vir elk van die vier parameters en dit het getoon dat die vier parameters oor tyd en ruimte varieer. Meervoudige veranderlike analises het bestaan uit nie-metriese multi-dimensionele skalering (NMS), groeperingsanalise, en indikatorspesie-analise. Groeperinganalises en NMS-biplotgrafieke is gebruik om die verkillende voëlhabitatte te karakteriseer (KVHe). Somer KVHe (somerplantegroei en antropogeniese faktore) en Antropogeniese KVHe (slegs antropogeniese faktore) is gekarakteriseer. Voëlspesies is daarna geördineer met die KVHe in NMS met opeenvolgende vektore, wat die verandering van voëlgemeenskappe oor tyd geïllustreer het. Assosiasies tussen voëlspesies en die verskillende KVHe is bepaal deur middel van indikatorspesie-analises.

Elkeen van die KVHe was geassosieerd met verskillende voëlspesies, en voëlgemeenskappe het ook kenmerkend by elke KVH oor tyd verander. Voëldiversiteit het ook gevarieer tussen die KVHe, en oorvleuelende en verskillende gemeenskappe het voorgekom tussen die KVHe. Voëls het ook hul habitats geselekteer na aanleiding van voedsel- en nesvoorkeure.

Gevolglik kan dit afgelei word dat omgewingsfaktore soos plantegroei, antropogeniese faktore, en seisoene ’n impak op die verspreiding van voëls langs die rivieroewers van Potchefstroom uitoefen.

Key words

Birds, Riparian corridors, Potchefstroom, Vegetation structure, Anthropogenic factors, Informal Settlers, Seasonal influences, Feeding guilds, Nesting guilds, Habitat selection, Converge and diverge communities, community trajectories

Sleutelwoorde

Voëls, Rivieroewers, Potchefstroom, Plantegroei strukture, Antropogeniese faktore, Informele settelaars, Seisoenale veranderlikes, Nes- en voedsel gildes, Habitat seleksie, Oorvleulende en diverse voël gemeenskappe, verandering van voël gemeenskappe

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List of abbreviations

GPS – Geographical Positioning System
RAD – Relative avian density
TAB – Total avian biomass
NMS – Non-metric multidimensional scaling
CAH – Characterised avian habitats
IV – Observed indicator value

The different CAHs
TSR – Trees, shrubs and reeds
T/G – Trees and grass
S/R – Shrubs and reeds
G/R – Grass and reeds
HSG – Herbs, shrubs and grass

C/R – Concrete riverbed
Dpi – Drainage pipes
Fpa – Footpaths
DrE – Dirt roads and electrical pylons
InS – Informal settlers
FpB – Footpath bridges
TrB – Tar roads, road and train bridges
Hou - Houses